

**Notice of Allowability**

Application No.

09/997,332

Examiner

Duyen M. Doan

Applicant(s)

BYRNES, PHILIPPE C.

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**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/27/05.
2. ☒ The allowed claim(s) is/are 1-60.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 1/19/06.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
**DAVID WILEY**  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2141

### EXAMINER'S AMENDMENT

The application has been amended as follows:

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Marie Switek (registration number 37,244) on 1/13/06.

The application has been amended as follows:

Please amend claim 1 as follows:

A system for monitoring and controlling quality of service and availability of a discrete event system composed of a computer communications network having intermediate nodes, said system comprising : an intermediate device, said intermediate device including memory for storing a traffic intensity surface therein, said intermediate device adapted to monitor traffic intensity by modeling the traffic intensity as a partial differential equation, said intermediate device sampling queue state information in intermediate nodes in said network and from this queue state information estimating the parameters of the partial differential equation model and solving the partial differential equation to produce the traffic intensity surface; said intermediate device configured to control traffic intensity by using several actuation mechanisms that include creating routes that minimize transit through congested regions of said network and downloading

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said routes to intermediate nodes for use in updating their forwarding tables, that include determining optimal times and locations for content caches to operate in said network and downloading said times and locations to cache content managers in said network, that include determining whether to correct bandwidth imbalances in said network either by buying and selling of short term bandwidth or by actuation of said network's topology and resources, including links [and/or] and intermediate node capacities, and downloading said bandwidth actuations to bandwidth managers in the computer communications network; and a set of traffic actuation devices, said devices including intermediate nodes responsible for relaying traffic between links in the computer communications network, including cache content managers responsible for deciding where to locate content caches in the computer communications network and when to have each content cache active, including bandwidth managers responsible for adding or deleting bandwidth in the computer communications network either temporarily or permanently.

Please amend claim 14 as follows:

An intermediate device for monitoring and controlling quality of service and availability of a discrete event system composed of a computer communications network having intermediate nodes, said intermediate device comprising memory for storing a traffic intensity surface therein, said intermediate device adapted to monitor traffic intensity by modeling the traffic intensity as a partial differential equation, said intermediate device sampling queue state information in intermediate nodes in said network and from this queue state information estimating the parameters of the partial differential equation

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model and solving the partial differential equation to produce the traffic intensity surface; said intermediate device adapted to control traffic intensity by using several actuation mechanisms that include creating routes that minimize transit through congested regions of said network and downloading said routes to intermediate nodes for use in updating their forwarding tables, that include determining optimal times and locations for content caches to operate in said network and downloading said times and locations to cache content managers in said network, that include determining whether to correct bandwidth imbalances in said network either by buying and selling of short term bandwidth or by actuation of said network's topology and resources, including links [and/or] and intermediate node capacities, and downloading said bandwidth actuations to bandwidth managers in the computer communications network.

Please amend claim 18 as follows:

A method for monitoring and controlling the quality of service and availability variables for a discrete event system composed of a computer communications network and its traffic load, said method comprising the steps of:

- (a) collecting queue state information from intermediate nodes in the computer communications network that is being managed and storing these in memory of an intermediate device;
- (b) estimating the parameters of the partial differential equation that describes the traffic intensity dynamic of the discrete event system and storing these in memory of an intermediate device;

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- (c) solving the partial differential equation that describes the traffic intensity dynamic of the computer communication network to yield the traffic intensity surface for the discrete event system and storing this in memory of an intermediate device;
- (d) generating optimal and suboptimal paths that are geodesics and non-geodesics, respectively, of the traffic intensity surface and storing these in memory of an intermediate device;
- (e) generating optimal and suboptimal routes by projecting the optimal and suboptimal paths on to the topology of the computer communications network and storing these in memory of an intermediate device;
- (f) actuating the traffic intensity by downloading the optimal routes to intermediate nodes for the purpose of updating their forwarding tables; and/or
- (g) determining the optimal times and locations for content caches to operate and storing these in memory of an intermediate device;
- (h) actuating the traffic intensity by downloading the optimal times and locations for content caches to operate to cache content managers in the computer communications network; [and/or] and
- (i) determining the times and locations of bandwidth imbalances in the computer communications network and their persistence and storing these in memory of an intermediate device; and
- (j) actuating the traffic intensity by downloading the time and locations of the bandwidth imbalances to a bandwidth manager in the computer communication network.

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Please amend claim 37 as follows:

In a computer system having a processor coupled to a bus, a computer system coupled to said bus and having stored therein a computer program that when executed by said processor causes said computer system to implement a method for managing quality of service and availability in a computer communications network, said method comprising the steps of:

- (a) collecting queue state information from intermediate nodes in the computer communications network that is being managed and storing these in memory of an intermediate device;
- (b) estimating the parameters of the partial differential equation that describes the traffic intensity dynamics of the discrete event system and storing these in memory of an intermediate device;
- (c) solving the partial differential equation that describes the traffic intensity dynamics of the computer communication network to yield the traffic intensity surface for the discrete event system and storing this in memory of an intermediate device;
- (d) generating optimal and suboptimal paths that are geodesics and non-geodesics, respectively, of the traffic intensity surface and storing these in memory of an intermediate device;
- (e) generating optimal and suboptimal routes by projecting the optimal and suboptimal paths on to the topology of the computer communications network and storing these in memory of an intermediate device;

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- (f) actuating the traffic intensity by downloading the optimal routes to intermediate nodes for the purpose of updating their forwarding tables; [and/or] and
- (g) determining the optimal times and locations for content caches to operate and storing these in memory of an intermediate device;
- (h) actuating the traffic intensity by downloading the optimal times and locations for content caches to operate to cache content managers in the computer communications network; [and/or] and
- (i) determining the times and locations of bandwidth imbalances in the computer communications network and their persistence and storing these in memory of an intermediate device; and
- j) actuating the traffic intensity by downloading the bandwidth imbalances to a bandwidth manager in the computer communications network.

### **Reasons for Allowance**

The following is an examiner's statement of reasons for allowance:

The prior art of record single or in combination failed to teach the combination of the invention as claimed in independent claims 1,14,18,37,55.

For example it failed to teach monitor traffic intensity by modeling the traffic intensity as a partial differential equation, intermediate device sampling queue state information in intermediate nodes in said network and form this queue state information

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estimating the parameters of the partial differential equation model and solving the partial differential equation to produce the traffic intensity traffic which clearly support by the specification pg.6-14.

$$\frac{du}{dt} + d(V1(t,x,y,u)u)/dx + d(V2(t,x,y,u)u)/dy = d/dx [(t,x,y,u) du/dx] + d/dy [D(t,x,y,u)du/dy] + f(t,x,y,u)$$

where

$u(x,y,t)$  = population density

$f(x, y, t, u)$  = general sink/source terms such as lateral boundary

flux (in mass density per unit time) and death/birth flux

$D(t, x, y, u)$  = diffusion coefficient

$V1(t, x, y, u), V2(t, x, y, u)$  = advection coefficients.

These features in light of other features of the independent claims 1,14,18,37,55 enable claims' allowable.

The dependent claims further limit the independent claims and are considered allowable on the same basis as the independent claims as well as for the further limitations set forth.

Hatono uses mathematical models (standard to the theory of Markovian queues and Brownian motion) to model the dynamics of the queue in a single network device. The teaching of Hatono is limited to a single network device, in contrast, the present invention discloses monitor traffic intensity by modeling the traffic intensity as a partial differential equation, said intermediate device sampling queue state information in



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intermediate nodes in said network and from this queue state information estimating the parameters of the partial differential equation model and solving the partial differential equation to produce the traffic intensity surface. Hatono confines his focus to the dynamics within the single networking device.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

**Claims 1-60 are allowed.**

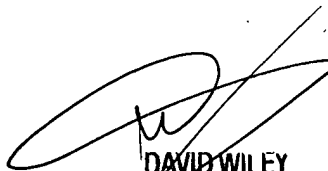
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duyen M. Doan whose telephone number is (571) 272-4226. The examiner can normally be reached on 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David A. Wiley can be reached on (571) 272-3923. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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